SUPPLEMENT.

The Mining Journal,

RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1124.—Vol. XXVII.] LONDON, SATURDAY, MARCH 7, 1857. [WITH JOURNAL] Stamped ....Sixpence. Unstamped..Fivepence.

THE "GREAT EASTERN," ONE OF THE WONDERS OF THE WORLD.

The following general particulars of the enormous vessel about to be launched will be of interest to most of our readers: She will carry 12,000 tons of coals, 8000 tons of merchandise, and 4000 passengers. The object of building so large a vessel is the economy that will be effected by being able to stow sufficient coals to carry her round the world. She will save about 9000*l.* per voyage to Australia in this item, by carrying sufficient to take her there and back, instead of having to coal at Australia. Owing to her length, she will not pitch, and will roll less than any ship that ever swam. She will be the strongest ship in existence, being built upon the principle of a hollow iron beam. There are 10 bulkheads or water-tight compartments; and there are longitudinal bulkheads, also water-tight. She is a double ship, complete and perfect, the internal hull being supported by boiler-plate stays three feet deep, and about the same distance apart, and riveted with angle-iron joints to the external hull, thus forming a cellular piece of work, similar to the top or roof of the Menai Bridge, and as strong as solid iron. This extends from the bottom of the ship, 30 feet up each side, until the first deck is reached. The two lower decks serve as bridges or stays; and the main deck is similar to the hull—cellular in construction—being in two parts braced together, making a fabric of immense strength. Were two of her water-tight compartments filled with water, she would hardly be inconvenienced. This noble vessel is 680 feet long, 83 feet broad, and 58 feet deep from her deck to the floor of her hull. Her tonnage is 22,500 tons. She will be propelled by two paddles and a screw. The paddle wheels are 56 feet in diameter, and the screw is 24 feet in diameter. The four engines to propel the paddle wheels are equal to 1350 horse power, and the four engines to propel the screw are equal to 1700 horse power. She will have five funnels connected to ten boilers, and six masts, which will carry acres of canvas. Four of her masts will be of iron—the two next the stern and compass of the ship will be of wood. Her crew will consist of 500 seaman. How many boats she will have we cannot say; but she will have abaft her paddle-box, on each side, a screw steamer 100 feet long. The whole ship will be lighted with gas. Her speed will be 15 knots—equal to 17½ miles an hour; and she will go to Port Phillip in 36 days. Some of the foregoing facts are tabulated in the following table:—

	Launched.	Dimensions.	Tonnage.
Great Western	1838	236 by 35½	1340
Great Britain	1844	322 by 51	3443
Himalaya	1853	370 by 43½	3550
Persia	1856	390 by 45	3400
Great Eastern	1857	680 by 83	22500

The vessel rests on two large cradles of wood, and will glide into the water side-on. She will be launched at low water, and will draw, when light, 16 ft.; when laden, 36 ft. She will be launched in August. Although this noble monument of human skill was built for the requirements of commerce and peace, she might prove, if need be, a powerful engine of war. Her immense capacity (22,000 tons), her own weight (12,000 tons), driven at the rate of nearly 20 miles an hour (the speed of a railway train), her bows, as sharp as a knife, would cut through the most formidable war ship afloat, if run into her. She could not be caught—could run down any ship, and, biding her time, could demolish a fleet.

MINERAL WEALTH OF SOUTH AFRICA.—No. I.

THE ROCKS AND MINERAL DEPOSITS OF NAMAQUALAND.

> The view man's mind can have of God's creation
> Bears great resemblance to a painted landscape
> That's painted by that mind; our observation
> Could not distinguish less conspicuous objects:
> And still, the whole does only represent
> The smallest speck of the world in which we live;
> And e'en of that it's not more in the end
> Than a mere copy, that attempts to give
> Of the appearance of one single side
> A likeness in mere colours, shade and light!

Some time ago, a great excitement was created in the Cape colony by some superficial observers fancying they had discovered a striking similarity between the nature of the ground in some parts of that colony, and the auriferous districts of Australia. A committee was formed, and 1000*l.* reward offered to any one who should succeed in discovering, in the western part of the colony, gold to the amount of at least 3000*l.* in value. No gold, however (excepting traces in the Orange River free state) was discovered, in spite of that resemblance in appearance between Cape clay and the clay of the southern El Dorado; but the excitement thus created found, unluckily, another object to seize upon, in the long known, but hitherto disregarded, mineral deposits of Namaqualand; and that momentous state of excitement was exceedingly favourable to the growth of a number of mining companies, which offered to many not very calculating speculators an opportunity of enjoying, in the doubtful shade of considerable sums of nominal capital, the dissolving views which the mischievous *spiritus speculatione mineralis* did let appear before their mind's eye.

But the majority of these mining companies have been sadly disappointed in their expectations, and only the lucky proprietors of Springbok and Wheal Maria Mines, Ughiep, Naparbap (all belonging to Messrs. King and Co.), and Hester Maria Mine, have at present vindicated the character of Namaqualand as a mining country, by exporting considerable quantities of copper ore; and they will most likely continue to do so. Whether, however, the above-mentioned mines be the only profitable deposits of Namaqualand, I have some reasons to doubt. The circumstance of being tolerably good pedestrian, and rather regardless of fatigue, having enabled me to become pretty well acquainted with that country, I beg to solicit a space in your valuable paper for the following communication, in which I endeavour to give some descriptive remarks respecting that country, thinking that others, such as possess a greater knowledge and experience than I do, might be better able than myself to deduce therefrom some useful evidences.

If the following lines should reveal that I have not seen many facts in the same light, nor drawn therefrom the same conclusions as prescribed by those geological dogmas whose correctness is at present taken for granted by a majority of geologists, it is because I deem it best in any investigation to be led in my ideas solely by the nature of the objects which are being investigated (and not by any, perhaps prejudicial, theories and hypotheses whatever, however universally accepted such may be) to such conclusions as appear to lie nearest and to be the most natural.

Attempts at investigating whether the interior of our globe be an aqueous or an igneous fluid—whether rocks which are never produced by any present volcanoes, nor are traceable near any extinct volcano, still have been produced by very ancient volcanoes—whether volcanic phenomena be the final results of that continually and universally active force which constitutes the basis of the progressive development of, if I might say so, the life of our earth's surface—or whether that agency be the result of our globe being one great volcano—all such attempts generally tend to lead into regions where there only flashes the uncertain torchlight of imagination, instead of the clear light of reason, and where the most simple and common matter-of-fact things often appear in a strange and extraordinary light.

The evidences that the high and steep mountains of our earth have been elevated originally by volcanic action are too many for this to be doubted; but supposing that the granitic base of the South African table-land had been elevated by such action in a similar manner as (only at much earlier periods than) the mountains of South America, then there exist unmistakable evidences that these granitic rocks must have been greatly metamorphosed, since the period of their elevation, by those subterranean and surface agencies which, although their action is very slow and gradual, and therefore scarcely perceptible to the ephemeral eye of man, still produce the most gigantic results in the course of time, by being continually and universally active; and I venture, therefore, to think that, with respect to that country, geological phenomena and peculiarities ought to be ascribed to those rather remote (volcanic or plutonic) causes only when it is altogether impossible to explain them by any of those agencies which are now still continually active and universally observable—by the infinite and ever changing combinations in the mutual chemical actions of metals and gases (minerals, water, air, &c.); the magnetic currents that exist everywhere on the earth's surface; the weight of great masses of, and the relations of density in, rocks; denudation, subterranean excavation (caused directly or indirectly by the action of water, weight of rock, &c.), causing the sinking of some and apparent rising of other parts, with accompanying dislocations, heaves, variations in dip and strike, &c.; for, by at once assigning all or any of such phenomena to volcanic (plutonic) action, we should assign them to a cause, an investigation of which would decidedly be quite beyond (nor is it at all likely that it will ever come to be within) our reach; and we should thus at once stamp geology as a science whose doctrines must ever remain vague, unreliable, and subject to be strongly doubted, because they would always be in want of clear, conclusive, and satisfactory definitions.

It is as unlikely that a fiery fluid should have been the basis of the water, which at one period, according to Holy Writ and geological evidence, enveloped the whole of our globe, as it is unlikely that fire forms at present the base of the deepest part of our ocean; and for the sake of not only bringing within reach of possibility, but of rendering it a perfect certainty, that the science of geology would advance yet to such a perfection that its definitions and doctrines would become as clear and reliable as those of mathematics, the greatest and most careful attention ought to be paid to all such agencies and powers, however insignificant they might appear at first sight, which are quite within reach of our observation; and, in order to be able to do that perfectly, we ought to discard all those theories and hypotheses which are not proved by clear and well-defined facts and evidences, and which might thus tend to mislead: we ought to discard the authority of the Pythagorean *ipse dixit*, be it even with the sacrifice of those hypotheses, which would fain make us believe that the human mind had already grasped the mystery of the world's creation.

Whosoever will seek to satisfy, at the bosom of pure nature, that mighty desire of seeing, of investigating the mysterious, must first be purified by the sacred fire of self-denial, and throwing away the cloudy veil of sensuality, selfishness, and prejudice, should choose solely bright truth as his goal, and less personal fame, which very often proves an *ignis fatuus*.

Little Namaqualand forms the northernmost district of the western part of the colony of the Cape of Good Hope, and is situated between the Oliphant and Orange Rivers, which latter separates here the colony from Great Namaqualand, whose inhabitants are independent of the British Crown. The western part of Namaqualand, between the mountains and the Atlantic Ocean, consists of a strip of low level (very slightly undulating) ground, which is covered mostly with fine sand, and the average breadth of which varies from 20 to 30 miles. The scanty vegetation which is growing on this "sandveld" (as it is called by the natives, bastard Hottentots, most of whom, in addition to their euphonic Hottentot, speak the Dutch language) affords pasturage to the ostrich, gemsbok (a large kind of antelope, with long, straight, and sharp-pointed horns, which, looking like one horn when seen from one side, might have given rise to the legend of the unicorn), several kinds of other antelopes, gazelles, hares, &c., and which is also haunted by hyenas ("strandwolf"), jakals,* wild dogs, &c.

The base rock of that "sandveld" (as much of it, at least, as can be seen on the coast, and a few spots further inland), which would appear to correspond with the European transition (greywacke, or silurian) formation, consists of various bands of slaty quartzose and arenaceous, and occasionally calcareous rocks, of a schistose structure, and of ridges of schistose "Table Mountain sandstone." The strike of these bands of rock is chiefly (with a few local exceptions, where it is curved) a little east of north; dip west, of various degrees at various spots. Thickness of strata I do not venture to define, having frequently noticed in South Africa, where the rocks and their structure are more exposed on the surface to the observation than in any other country, that many bands of rocks, especially the primary (metamorphic) and transition rocks, decrease in thickness downwards. Those rocks are traversed by numerous runs of milky, ferruginous, and vitreous quartz, most of which run parallel with the main cleavage plains, and which occasionally contain iron ore (specular iron in quartz, iron pyrites, &c.)

I did not succeed in discovering any other mineral deposit in those rocks. Worthy of notice, is the occurrence of ruby and garnet sand, with which there are occasionally intermixed minute opals, and which sand is found on several spots of this coast, though not in large quantities. I tried to discover the parent rock from which that sand must have been brought down; but although I found on several spots further inland rocks, of which garnets and rubies formed accidental components (rocks chiefly of the gneiss-series), still on the coast I only found one small strip, in an argillaceous slate, that contained garnets.

Several miles to the east of the coast (further inland) are found traces of ancient sea beaches, and in the loose sand, as well as in the sandstone (the same sand, in the shape of a compact mass, generally more ferruginous) of that coast occur numerous shells of still living species, which, however, do not deserve as yet the name of fossils. Within that "sandveld" there occur small basins, of a perfectly level, and comparatively hard bottom, where the ground is highly impregnated with salt. Such spots are often covered with thin sheets of brackish (salt) water; digging to a depth of about 7 feet to 9 feet, I found (in the dry season) a thin (1 foot) seam of bluish clay underneath that sand, and underneath that clay again a tough sandstone. I did not meet with any real fossils.

* Having been shipwrecked on that coast, we existed there for several months, and our ears were rent every night by a concert of those beasts, to whom the drowned mules and horses lying on the beach proved a point of great attraction.

The sea on that coast—if two years' personal observation, and information received from others, could justify such an idea—seems to be receding, or rather the sandy coast gradually encroaching upon the sea; and it is not unlikely that the small bays on that coast, which at present afford shelter to small vessels, would, in the course of time, become impracticable even to those small coasters.

To the east of the "sandveld" is the mountainous district of Namaqualand, within which there occur the mineral deposits of that country (iron, manganese, copper, lead, bismuth, nickel, molybdenum—traces), and which may be divided into southern (Upper Orange River, Sohaap, and Buffalo River*) and northern (Lower Orange River) district. When the rocks of the former are of a pre-eminently granitic nature, and when the largest and most bulky mineral deposits occur in the former within granitic rock (gneiss), the rocks of the latter are principally of a schistose nature, and mineral deposits in the latter occur chiefly in schistose rocks, and only traces in granitic rock. I fancy that the difference between the southern and northern part of Namaqualand bear, in some respects, a resemblance to the difference between Cornwall, Devonshire, and North Wales.

The mountainous part of Namaqualand is also rather destitute of vegetation, and nothing but a few shrubs are found there, with the exception of the river beds, which grow numerous thorn trees and bushes (mimosa), and a few alluvial basins (shallow, and generally situated on higher levels), where the natives belonging to the respective missionary stations grow a scanty supply of grain. Here and there a solitary "kocher-boom" (trees with a thick straight stem of a loose fibrous texture, their bark like that of birch trees, but darker, leaves thick and aloe-like), and occasionally, though very rarely, a small group of "kameel doorns" (*acacia giraffae*) enliven the barren landscape. Occasionally, however, the mountain scenery is really picturesque and imposing; deep valleys and fissures, groups of immense masses of rocks, mountains of all sorts of fantastic shapes, changing with almost level mountain plains, from whose edges we often obtain a splendid view of the country, and where, owing to the perfect purity and clearness of the South African atmosphere, we can distinguish objects an amazing distance off—the farthest mountain ranges often, especially early in the morning, appearing quite fairy-like, and as if they were swimming in the air, a long seam of a *stratum* of silvery pink clouds separating them completely from the remaining landscape.—Julius.

GEOLOGY—PRIVATE LECTURES ON THE EARTH.—No. I.

THE PRODUCTIONS OF THE PRESENT, AND RELICS OF THE PAST.

The superficial organic covering of the globe, the geographical distribution of plants, and the characteristic features of the different zones, are subjects of investigation peculiarly interesting to the scientific observer.

Whether we examine nature in its minutest details—tracing the affinities of certain forms, and revealing their elaborate organisms—or whether, on the other hand, we view the phenomena, presented in its grander aspect, as one comprehensive whole—we cannot fail, in either case, to be impressed with the beauty and simplicity of construction, and harmony of arrangement, everywhere manifested in the whole economy of nature. But it is only in the latter case, by surveying nature *en masse*, that we are able to grasp those great laws which regulate the organic creation.

There are notions respecting the order of the distribution of plants which are so erroneous, and yet so prevalent, as to render a few remarks on this point not irrelevant. It is commonly believed that the floral productions of the organic kingdom, in corresponding latitudes each side of the equator, if not identical, are at least so analogous as to be considered the same; and such a conclusion seems to have arisen from a preconceived mistaken assumption, that similar temperatures were productive of similar forms on opposite sides of the equator. Now, that a comparatively large amount of incontrovertible data have been accumulated by the efforts of many distinguished botanists, and other observers, we are at the present day more competent to generalise, and deduce theories, than were those who, without such essential materials, worked as it were in the dark.

Generalisations may now be more safely introduced, and the interpretation of unexplained phenomena be more easily effected; it, therefore, ought not to surprise us if we find many of the old dogmas untenable, and amounting to nothing more than mere speculations.

We shall at once proceed to examine the actual conditions of the existing organic system in the different zones. For the sake of convenience, and with the hope of rendering the subsequent part of our enquiry more explicit, and its connection more apparent, the different regions of the globe will be comprehended in the three great zones—namely, firstly, the South Temperate, extending from the Tropic of Capricorn to the Antarctic region; secondly, the Torrid; and thirdly, the North Temperate from the Tropic of Cancer to the Arctic circle.

It will be well to observe, when we speak of zones in connection with the organic system, that we do not restrict ourselves to the exact mathematical boundaries, determined by the angular position of the axis of the earth in its relation to the sun, but rather to regions dependant on the superficial, physical conditions in connection with the ocean, the tides and the configuration of the lands, analogous to the isothermal lines of Humboldt.

South Temperate Zone.—This zone comprehends the southern portions of Africa and South America, part of Australia, Van Diemen's Land, New Zealand, and the neighbouring islands.

On taking a general survey of the vegetable kingdom of this zone, we cannot avoid being struck with the great prevalence of arborescent forms of ferns and succulent plants. And that this peculiarity is one of a distinguishing character to this region, we shall find to be the more evident, on examining the characteristics of the other zones.

The growth of the vegetable covering in this part of the globe attains its maximum; but a poverty in the numerical value of species is found an accompanying feature. Certain peculiar forms, indigenous to the countries, belonging but to a limited number of genera are found constituting nearly the whole of the flora of this region.

Although we are as yet unacquainted with the flora of many parts of Australia, South Africa, and other remote countries of the south temperate zone, the conclusion, that the same relative proportions as those observed in the known vegetable creation exists also amongst the productions of these unknown tracts, is one which we may assume without any danger of error. It cannot, therefore, be argued that our deductions of the known will be in any way affected by the conditions of the unknown. We may then safely proceed with our generalisations which will be confined to those parts already known to us, taking the predominance of certain groups,

* Of all the Namaqualand rivers, only the Orange River contains running water; all the others are mere dry river beds, here and there pools of water or water at shallow depths underneath the sand; but at certain periods the water comes rushing down these rivers with great vehemence, swamping all before it.

in connection with their individual physiological aspect, as data whence to determine the characteristic feature of the zone in which they abound.

Many forms are found so much distributed over different zones as to render them characteristic of no particular one; the occurrence of such vegetable productions, not contributing to the general elucidation of the law at which we wish to arrive, will, in the present enquiry, receive but little attention. The character of the individual development of such forms, however, will be found assuming different peculiarities in the several zones, serving as features, in many cases, sufficiently well marked to be worthy of notice.

Firstly, then, may be mentioned the *fern family*, as constituting a group peculiarly luxuriant in this zone, and attaining a magnitude nowhere to be met with in the torrid, and much less in the north temperate zone.

FELICES (the Fern Family).—It is to be observed that all ferns growing in the south temperate zone are, generally speaking, essentially arborescent. Here they are found in the most perfect condition, and appropriating to themselves all the nourishment which they can absorb from the neighbouring soil, to the utter exclusion, in many parts, of all other plants. The following quotation will show that this feature has been observed by others:—

"Dr. Hooker thinks that the prevalence of ferns may be regarded as a probable evidence of the paucity of other plants, and the general poverty of the whole flora which characterised the formation. He is led to these conclusions from observing the mode in which the ferns in Van Diemen's Land and New Zealand monopolised the soil, choking plants of a larger growth on the one hand, and admitting no undergrowth of similar species on the other. In New Zealand he has collected 36 kinds of ferns on an area not exceeding a few acres; they gave a most luxuriant aspect to the vegetation, which presented scarcely a dozen flowering plants and trees besides."*

In reference to the same island, Sir Chas. Lyell remarks that "the botany of this region is characterised by the abundance of ferns," &c.

In the colony of Victoria, where the region is somewhat arid, and much exposed to the hot winds and sands of the interior of Australia, we again find, in the humid shades of the Yarra Yarra River, and in the creeks of the Dandeyong ranges, an abundance of tree-ferns, together with rich and luxuriant succulent plants; the relics of these are found embedded in large quantities in the neighbouring swamps. Thus the vegetation here presents the same aspect as that of New Zealand and Patagonia.

MYRTACEÆ (the Myrtle Family).—This group of the vegetable kingdom is found to constitute another prevailing peculiarity of the southern hemisphere. Next to the ferns, it certainly may be said to predominate most largely in the countries of this zone. The following quotations are from the writings of the distinguished botanist Meyen, unless otherwise stated. In reference to Chili he says—"Myrtles 30 and 40 ft. high, and with trunks 3 and 4 ft. thick, still grow in this region."

"The beautiful forms of the genera Leptospermum and Bœckia" of this family "also belong, almost without exception, to New Holland."

Another genus, "the Melaleucæ, which, with their conifera-like crown of foliage are one of the principal forms of New Holland, constitute much towards forming the character of Australian vegetation." "Melaleucæ, leucadendron, and cajaputi, enter the territory of the erica form, and appear in the southern extremity of Africa." Of the other continent he likewise observes—"The myrtles in South America probably extend to corresponding southern latitudes, for they grow in the greatest luxuriance in the middle of Chili." Another genus, belonging to the myrtle family, Meyen mentions as peculiarly luxuriant in this zone—"the eucalypti, which belong exclusively to New Holland and Van Diemen's Land, sometimes reach an enormous circumference; for eucalyptus globulus *labill*, and another species peculiar to the south of Van Diemen's Land, not unfrequently attain a height of 150 ft.; while the trunk near the ground is from 25 to 40 ft. in circumference!"

Of forms directly allied to the foregoing may be mentioned protea, epacris, and erica, which reach their maximum in the southern hemisphere. "The epacridæ also, with the exception of a few species, belong to the southern hemisphere only, and in it New Holland is peculiarly their native country. The Cape of Good Hope is in the same way the country of the erica," &c.

CONIFERÆ (the Cone-bearing Family).—Although this family abounds in the temperate regions of the northern as well as the southern hemisphere, yet we shall find that what has been said with regard to the individual growth of the preceding forms holds equally good here. According to Prof. Balfour, "four genera of coniferæ, *araucaria, phyllocladus, microcachrys*, and *arthrotaxis*, are peculiar to the southern hemisphere. The following attain their maximum to the south of the tropics:—"*Callitris, podocorpus*, and *dacrydium*." "*Entassa* (*araucaria*), *excelsa*, is the Norfolk Island pine, famed for its size and for its wood." And again the same author observes—"The flora of Chilli approaches that of New Holland, the Cape of Good Hope, and New Zealand, in *goodenia, araucaria, proteaceæ, gunnera, ancistrum*."

LEGUMINOSÆ (Bean tribe).—To this order a group found plentifully in Australia, as well as in other parts of this zone, is said to belong. Meyen informs us that "the acaciæ predominate in the southern hemisphere of the old, as well as the new, world; New Holland is especially their country, where they appear with leaves of a singular form, and thus give the vegetation a peculiar, or as we say, an Australian character." * * * "In South America, particularly on the western coast, acacia caven, as well as several species of prosopis, extend south beyond Conception; on the table lands in the centre of Chilli, even above the altitude of 3000 ft., are sometimes whole forests of these plants of the mimosa form."

In South Africa this form also occurs, for Prof. Balfour states that "a kind of gum is procured at the Cape of Good Hope from acacia karoo," &c.

Even from this cursory glance at the flora of this zone, we find the chief characteristics to consist in the production of but a comparatively limited number of genera, which are remarkable for their vigorous growth. Grasses belonging to other zones, when artificially transplanted in the soil of this region, become arborescent; their stalks here attain a size and strength sufficient to support their lofty sheaves, and withstand the effects of winds and other natural external causes. That this difference is owing to the influence of the zone, and not the species, is proved by the fact that plants which are in England annuals, become, when transplanted here, perennials. This has been observed to be the case even with barley, wheat, beans, &c. The myrtle, fuchsia, and ferns, are timber trees to the latitude of 50 degrees south, and the humming birds are common in the forest.

In short, the characteristic productions of this zone are *tree-ferns* and *arborescent forms* of the *conifera, bean tribe*, and *myrtle* family. These arborescent forms are not confined to the warmer parts, but extend to the south frigid circle.

STEAM-ENGINES.—M. de Combettes, C.E., Lyon, France, has patented an invention which consists in causing steam to act upon a pendulum to make it vibrate, and in communicating power to a crank through a connecting rod affixed to the shaft of the pendulum. The pendulum is suspended from a shaft, supported in bearings in a suitable frame, and has connected to it, at oppposite sides, two pipes. At opposite ends of the frame, and near the end of the course of the pendulum, are two other fixed pipes, which are received by and enter into the pendulum pipes. Slide valves, worked by projections upon a boss on the top of the pendulum shaft, admit steam into and cut it off from the fixed pipes. Steam being admitted into one of the fixed pipes, rushes into one of the pendulum pipes and impels the pendulum towards the opposite fixed pipe, the steam escaping out of the pendulum pipe into the atmosphere. On the pendulum arriving near the end of its vibration, steam is admitted into the opposite fixed pipe, checks any shock and drives back the pendulum, the vibrations being continued by the admission of steam alternately into the fixed pipes. A governor regulates the admission of steam to these fixed pipes. This invention is susceptible of several modifications, for instance, instead of the steam escaping directly into the atmosphere, the pendulum and fixed pipes might be made so long as that they should continually work one within the other, and then the pendulum on its return vibration might be made to expel the steam which had served first to drive it through a passage to be opened by one of the slide valves.

THE METAL TRADES.—A very useful Chart, prepared by Mr. Johnston, metal merchant, of Glasgow, is now ready: it contains, amongst other information of the greatest interest to all connected with the metal trades, an elaborate diagram, showing at one view the prices of the principal metals during the past 16 years, the Birmingham wire and metal gauges and the modern Belgian zinc gauge, the weight and thickness of lead piping of various diameters, &c., thus forming a valuable work of reference for the counting-house of the iron merchant or broker. Copies may be had at the office of the *Mining Journal*. Price: Mounted, on rollers, 21s.; on plain sheet, 15s.

*** Four volumes of the TRANSACTIONS OF THE NORTH OF ENGLAND INSTITUTE OF MINING ENGINEERS are now published, and contain a large number of highly valuable Papers by eminent scientific men. The volumes may be had, together or separate, at the MINING JOURNAL office, price 21s. per volume; or by order of any bookseller.

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* Prof. Balfour.

MINES AND MINERALS OF AMERICA—No. VIII.

THE COAL MINES OF CHIRIQUI, NEW GRANADA—AND NEW ROAD ACROSS THE ISTHMUS.

One of the most commendable projects that has for a long time been brought before the notice of the American public for the safe and profitable investment of capital, is the Chiriqui Improvement Company. Being intimately acquainted with some of the leading members of the board of direction, the geologist, and other gentlemen who have recently returned from an exploration of the entire lands from ocean to ocean, knowing their highly respectable position in society, and the commercial and business qualifications of the promoters and chief leaders in this undertaking, I feel confident the object sought is one of legitimate enterprise. I am not in the habit of writing anything for the columns of the *Mining Journal* unless it comes under my own immediate examination, but having been consulted as to the merits of the undertaking, and the quality of the minerals produced, and being aware that several London houses are on the eve of embarking in it jointly with those of New York, the few comments I here make may be considered interesting to some of our mining community.

The coal lands are situate on the eastern and north-western shores of Chiriqui Lagoon, a large inland bay, landlocked on every side, except at its entrance from the Carribean Sea, in the Atlantic, where it is narrow, but having over 20 fms. of water; the bay is about 25 miles long by 15 wide, with a depth of water close up to its shores capable of safely floating the largest class of merchant ships, thus affording every advantage in transporting the produce of the mines to the termini of the new road. Prof. Manross, the gentleman who conducted the geological department of the surveys, describes the formation wherein the coal is found to be the early tertiary, and the belt, as far as explored, exceeds 50 miles. He says, in the islands of Admiralty Bay there is no lack of evidence to fix the age of the strata throughout its entire extent. Many fossil shells were found of species now existing in the adjacent waters. Trunks of trees in a partially carbonised state occur both above and below the coal; they are apparently of the same varieties as those now growing over the spot. Leaves of dicotyledonous trees, and fruit of a modern species of the palm, were taken from the soft strata, in contact with one of the seams of coal. None of the fossils of the older rocks were found, and the coal is similar in character to that of France and Belgium. On the southern shore of the bay, or main land side, the formation is of the primitive order. The map that accompanies the report does not define the line of junction of the two formations, therefore it is somewhat difficult to decide in any definite manner the number of seams that lie imbedded in those measures; but they appear to have a course north-westerly, dipping at an angle of 20° north-east, or under the sea. There have been 10 or 12 openings made on the coal, which are shown on the map, one at each end of the lagoon, and the others about 10 miles inland, west of Admiralty Bay; their respective localities are named as Secretary, Saddle Hill and Pope's Island, and Sierschick, on the Chanquiola River. Now, if they are correctly plotted on the map, and their strike is correct, they represent three distinct series of seams, those on the Chanquiola River being the lowest in the system, and that of Secretary the upper, or highest. The specimens of coal shown me at the offices of the company, and described as being taken from the several openings, appear to agree with such an hypothesis. There are certain contortions, breaks, and faults met with which, as a matter of course, must be expected in the proximity of a volcanic country. The strata is also pierced with trap, or elvan dykes, but the present explorations have not been carried out sufficiently far to determine their position or bearing on the measures through which they are protruded; nevertheless, there is quite a sufficient quantity of coal immediately available to meet the requirements of an extensive trade, and this, too, without any expenditure of capital for experimental mining. I will now commence with the easterly limits of the coal formation, at Secretary, a promontory forming the north-east side of the lagoon; here, says Professor Manross, three seams of coal crop out on the beach; they are seen in a cliff some 40 ft. high; the upper one is 4 ft. thick, the second 6 ft., and the lower 2½ ft.; this is new, or soft coal, making an aggregate of 12½ ft. The specimens I have seen from this seam, I should think, would give 75 lbs. per foot, making 8⅝ tons to the superficial yard of the united seams, and, allowing 25 per cent. for waste in working, will give 23·750 tons to the acre of merchantable coal. It is but reasonable, however, to suppose that with increased depth these seams will become diminished in thickness, but then their increased density will make up the deficiency. The next opening is on the north side of Pope's Island; the seam is said to be ruptured, but the coal is much harder than at Secretary; I am of opinion that this is the lower, or one of the lower seams of Secretary. South-west of this are the workings at Saddle Hill; they are described as being situate about half a mile from the shore; in this locality are found nine seams, varying from 1 to 5 feet in thickness, with a length of five miles in extent. In estimating the value of these mineral lands, only the lowest portion should be taken into account; these will give an aggregate of about 20 ft. The coal is said to be of an inferior quality, but this is not likely, only as regards its appearance as seen at the outcrop. This group of seams, according to the map, must be the middle series, and therefore better in quality than those at Secretary; the specimens are of a much harder nature, and although they bear the evidences of exposure to water and atmospheric action, still they promise at a proper workable depth to become a first-class quality coal. I do not consider the openings have been driven in far enough as yet for any one to form an opinion of the seams, either in their thickness, number, or quality; a seggregated mass of outcrop coal is no criterion to judge by. The specimens produced are beautifully clean and bright in their fracture; the partings contain a little carbonate of lime, but no sulphur; and its specific gravity is higher than those before described. Allowing one-third for waste in narrow seams, and 80 lbs. to the foot, the 29 feet will give 12½ tons to the yard, or equivalent to 36,210 tons to the acre.

This is all the coal that is positively known on the shore of the lagoon, but a glance at the map will show, that if the carboniferous formation stretches away south as far as Robato River, the coal seen in the Cultivation Creek, on the shore of Shepherd's Harbour, will come in and underlie all the seams of Saddle Hill and Pope's Island; should this be the case, no further search for coal need be made for the next 100 years for the supply of the new towns on the lagoon.

Traversing westerly, in a line parallel with the south shores of Admiralty Bay, for a distance of about 20 miles, several seams of coal, of a far superior quality, are found in the creeks branching out from the Chanquiola River; they are said to be from 1½ foot to 3 feet thick; their outcrop is at an elevation of 434 feet above the level of the sea. These are evidently the lowest seams of the measures; I draw this inference from the density of the coal, but it would be easy to ascertain this fact, by proving the locality of the junction of the primitive with the secondary formation. Here, then, is a coal field equal in extent to the whole of North and South Wales, and placed, as it would seem by Nature for the use of man, about midway on the great highway of nations, a spot the most admirable for the steam marine of both oceans. The value of these mineral lands to the owners will, in the course of a few years, be immense; but individual advantage falls far short of their intrinsic value; they are destined to disseminate their utility among all the civilised nations of the world; for there can be but little doubt that New Granada will be the main line of traffic eventually across the isthmus.

The coal is of a kind which may be classed as semi-bituminous, or steam coal; it will not coke; it burns with a very strong white flame, and gives off but little smoke; it ignites freely; does not crumble on the evaporation of its volatile constituents; makes a hollow fire, and resists a powerful draft. I have tried some few experiments with it on a small scale, and am very well satisfied it is, or will be, a few yards in depth, a first-class steam coal. An analysis by Dr. Chilton gives its specific gravity 1·270, and its component parts in—Volatile matter, 37·29; fixed carbon, 56·53; ashes, 6·18=100·00. A second kind gives a little more carbon and less bituminous matter, as per assay—Volatile matter, 34·12; carbon, 59·38; ashes, 6·50=100·00. I suppose these to be the average of the upper seams. I cannot think the assay was on the lowest; for I have a specimen that gives 1·350 specific gravity; and this day I placed a lump on a clear anthracite fire, it burnt without any perceptible smoke, and after the flames went off, I could not tell it from the incandescent anthracite itself; I have no doubt that this specimen yielded 75 per cent. of carbon. From the description given of the local position of the seams at Secretary and Saddle Hill, I should think the coal can be mined, and put on board, all expenses included, for 4s. 6d. per ton; if it is sold at $2 (8s. 6d.), which would be very cheap, an excellent margin of profit is allowed for the company; there is but little doubt of the mining department becoming a profitable branch of the trade that will arise from the opening up the new road.

On the Pacific side of the land coal has also been discovered; it is on the company's land, near the shores of Golfo Dulce, but no report as yet has been received by the company, and I am inclined to think further trials will have to be made before any reliable report can be brought before the public.

At the east end of the lagoon, in the streams around Catabello Creek, extensive deposits of gold have reported. They were visited by Professor Manross and Captain Bonner; they say they examined several streams from all of which gold was obtained by panning (vanning with a pan); the yield was about 40 cents., equal to 1s. 8d. per bushel of sand. They think gold will be found in nearly all the streams that have their rise in the mountains of this district; the Indians are fully aware of the existence of gold in many other places, and when a regular settlement is established, will show the company's agents were they are. Grains of platinum are also found in the same streams. These diggings are not much prized by the company; they are looking to the more substantial mineral, the "black diamond;" nevertheless, they will attract in time the notice of the adventurous, and will assist the company by bringing gold into the port, if the adventurers do not succeed in taking any away; it will also aid immigration which is now much wanted.

The new road—the line pointed out is shown on the map—commences near the Robato River, and traverses the mountain pass of Boqueto and Chiriqui volcano; its highest elevation is said to be only 2000 feet above the Atlantic tide-water, while the mountains on the west side rise to the height of 11,260 feet; the road will terminate at the shipping port and town of David, on the Pacific. It is at first proposed to be a Macadamised road, which can be constructed at a comparatively small expense. Mr. James B. Cook, the engineer, who surveyed it, says the route lies between 7° and 9° of north latitude, and 81° 5' west longitude. In its geographical position there is nothing on the Isthmus of Panama that can compete with this in the province of Chiriqui; its topographical facilities have by far a superiority. Two-thirds of the road require little or no heavy work; the other third, passing over the Cordilleras, will want some little cuttings and embankments, in order to render it level. The whole distance is 55 miles; for the first 27 miles from the Pacific the plains are gradually elevated, the grades not exceeding 1 in 63; here it enters the passes of the mountain, and running around the spurs at grades varying from 1 in 35 to 1 in 60, for a distance of 10 miles; it then gradually descends for the next 20 miles towards the lagoon, at an inclination not much exceeding 25 or 30 feet per mile; there is nothing in all this distance unfavourable to a railroad.

The lagoon is the finest harbour of the isthmus on the Atlantic side, It excells in beauty, deep water, a ready and well-defined entrance, and other natural advantages, not the least of which are streams of the most delicious fresh water, pouring down in never-failing supply from the mountain slopes. The same thing also exists at the termini of the road on the Pacific side. Notwithstanding those streams are rapid in their course, they do not run out, or become exhausted, in the dry season. The reason of this is obvious: the peaks of the lofty mountains rising for some thousands of feet above the line of the road penetrate the dense masses of vapours thrown up by the rapid evaporation of tropical climates, and form conductors, around which is condensed the irrigated supply of the valleys below. Mr. Cooks considers that the entire road, including bridges, toll-houses, inns, and stables, and all its necessary appendages, will not cost more than 100,000*l.*, and that it could be got ready for traffic easily in twelve months.

A report on the climate, productions, inhabitants, &c., by J. Eugene Flandin, Esq., of New York, who has spent nearly two years in the province, is a most valuable and interesting document. He says Chiriqui is bounded on the north by the Atlantic, east by the province of Veraguas, west by Costa Rica, and south by the Pacific. It was one of the first points of the American continent touched by Columbus, and yet scarcely known at the present day. From the lagoon it is only eight days' steam sailing from New York, 130 miles from Aspenwall, and 160 from San Juan, or Greytown. Two of the finest harbours in the world exist at each extremity of the proposed road: that on the Pacific much resembles, from his description, Milford Haven, in Pembrokeshire. That on the Atlantic is protected from the wind and sea by a natural barrier, or breakwater, formed by a run of islands and promontories. Most accurate surveys and charts of this harbour have been made by the English Government, and published by the Hydrographic Bureau of London, indicating the soundings of even the inner recesses of the harbour. The bay of Golfo Dulce, and harbour of Golfito, on the Pacific side, have been surveyed by the French Government, and Admiral Petion strongly recommends it as a naval station for the French fleet in the Pacific. To carry the road to this spot would be only about 25 miles further. The land lies nearly level the entire distance. The Golfo Dulce has very deep water; it runs 30 miles inland, with a width of six miles. On its shores the company own about one million acres of freehold land. In addition to this, they have an exclusive grant for 60 years to improve the old road from David to Bocas del Toro, with full powers to impose such tolls as may be considered beneficial to the company. This grant carries with it about 100,000 acres of land. They have also 40,000 acres of the rich mineral lands of Bocas del Toro, which are free from all taxation or incumbrances of any kind. The Indian name, "Chiriqui," signifies the "Valley of the Moon." The population is about 25,000, but only about 2500 of these dwell on the Atlantic side of the Cordillera: they are mostly black—mixed Indians, real Indians, and a few Spaniards. Being the descendants of parents from Jamaica, they speak the English language. David is the capital on the Pacific: it contains 4000 inhabitants, who are principally a mixture of Spanish and Indian. The Chiriquinos proper are a quiet, goodnatured set of men, able and willing to work, and rank ahead of any other natives of the Isthmus provinces. Mr. Flandins says, "I have proved these people, when they found they were to be paid for their labour, to be hard and willing workers. The company found no difficulty in procuring plenty of good men at 2s. per day. We had abundant evidence of this. A great many applied for work at a much less price than the above. From 300 to 500 men could easily be obtained in a very short time, if required. Several of the Indian tribes, also, are very quiet, well-disposed people, and willing to work. They do not speak Spanish, and appear to have a great dislike to the race. Those we employed I found quite intelligent; they were very eager to learn. With them everything is English that is not Spanish—a strong proof of partiality to us. This I noticed at various times, by their offering to show us where the gold deposits were to be found. They say they like us because we were not Spanish. They have an old grudge against that nation. The wrongs heaped upon their ancestors by the Spaniards seem to have been treasured up and handed down through generations, creating a traditional hatred to the whole Spanish race. We never knew of an Indian divulging any valuable discoveries to a Spaniard.

The climate is renowned for its healthiness. The total absence of all swamps and marshy ground renders this portion of the isthmus an exception to the general rule. It is free from the extremes of heat and cold, the thermometer ranging from 68 to 92 Fahr., rarely reaching these points. It is tempered by the sea breeze during the day, and the land winds from the mountains during the night, so as to give a degree of freshness in the very warmest weather. The days and nights are about equal all through the year, while the clearness and purity of the atmosphere, and the beauty of the heavens, exceed anything ever witnessed in the North. Epidemic fevers are unknown. His own personal experience proves the fact of the healthiness of that region. Numbers of physicians, belonging to the French and English men-of-war, attest the fact, while an examination of the appearance of the native population renders the matter conclusive.

The soil is eminently rich and fertile, adapted to the growth of every inter-tropical grain, fruit, and flower. Its surface is varied with mountain, valley, and plain. The northern part may be called the forest region: its produce is rice, coffee, maize or Indian corn, of which two crops per year are easily obtained. The sugar cane is of large size and richness; tobacco equal nearly to that of Cuba; cocoa of the best quality in many places is found growing wild; the cultivation of this tree is one of the most profitable kind. Vegetable silk, or *sois d'alger*, grows abundant. Pepper, ginger, and all the common spices, are easily cultivated. The olive, grape vine, and tea plant find here a congenial soil; the latter grows wild. Oranges, melons, lemons, limes, pine apples, cocoa nuts, guavas, mangoes, dates, &c., are in great abundance. The trees are various, from the finest ship-building timber to the fancy cabinet woods. The gum trees produce the caoutchouc or india-rubber, palma christi, gum mastic, dragon's blood, and many medical plants. All descriptions of vegetables, particularly the potato, thrive well, and produce excellently. Wheat, barley, oats, peas, and rye no doubt would give excellent crops,

ild. The system of agriculture pursued by the inhabitants is of the primitive kind. Such a thing as a plough was never heard of until ily in Chiriqui. No kind of common agricultural implements are d: they burn the surface of the ground, and then with a stick make a , wherein they put the seed, and cover it over: little or nothing more done until the harvest is ripe. Chiriqui, with about 500 English and Dutch farmers, would become an exporting province. The bays and rivers abound with all kinds of fish, particularly the turtle, and the woods with game. In the mineral department coal and gold are well known. has been found, and there are strong indications of lead and copper. extended geological and mineralogical survey is much required.

COLONISATION.—Up to this time no colonisation with foreign emigrants been attempted, yet the vast advantages that must arise from such source will become apparent to every one. The local Government has done, and is willing to do, everything to aid the great natural resources of the country, and the company will meet every facility they require. The constitution is the most liberal; it secures to foreigners all the same civil rights as to Granadians, with a perfect toleration in religion. This matter is one of the greatest importance to the welfare and future progress of the colony. The titles of the lands have been closely investigated, and the grants and deeds prepared with great care, and in strict conformity with the laws of New Granada, so as to prevent the possibility of any future misunderstanding as to the company's rights.

This article has been compiled from a mass of valuable documentary statistics, collected with great cost, trouble, and time, by the company and their friends. I have merely outlined the most prominent features of the undertaking. The company's capital is only 400,000*l.*, in shares of 20*l.* each. I consider their capital much too small, when we look at their immense landed possessions; it certainly ought to have been anything less than 1,000,000*l.*, but they say their object is not for speculations. They want every one to benefit by the undertaking, and if they can obtain the co-operation of the London and Paris capitalists, and the scheme is carried out in its integrity, the world, in five years' time, may look with wonder and admiration at an achievement in modern colonisation, unprecedented in the annals of nations.

I cannot conclude without quoting a few graphic passages from the able report of Mr. J. E. Flanders:—"This," says he, "is a virgin spot on the earth's fair surface. Population is all that is wanted to make this apparent desert bloom like the rose. Look at those Savannahs, those immense plains, bounded by the majestic Andes on the north, far off in the distance, and stretching away to the great Southern Sea, covered only by a few thousand head of cattle, with little or no cultivation, through the oak region of the Cordilleras down to the Mangroves on the sea-side. What a field for human industry. The farmer could here select any soil or temperature he required. A population of industrious and moral families, who ask no other blessing from God, or their fellow-men, than to 'earn their bread by the sweat of their brow,' would find here wealth, competence, and contentment. If they were only once to see the country they would exclaim, as many have done, 'What a pity so much fine land, and so accessible, should remain barren for want of hands to accept the bounty so freely offered!' How many hundreds of thousands of cold, half-starved, shivering beings would here make a happy home—how many escape the terrible pangs of want consequent on poverty. The cow and the plantain tree feeds the poor native, almost without care on his part; and if his thatched roof does not leak, he merrily sings, 'Begone dull care.' With one half the labour required in Europe, a family could here become independently rich. Chiriqui to the hardy English race must be like what Canaan was to the Israelite—the land of promise, a land flowing with milk and honey."

Southampton, Mass. CHARLES S. RICHARDSON.

SORTING ORES AND SEPARATING METALS BY ELECTRIC AGENCY.

MM. Chenot, of Clichy-la-Garenne, Paris, have invented some improvements, which consist in sorting pounded ores, both with respect to volume and to density. The first operation may be effected merely by the sifting process, or better by means of a novel apparatus, called a "deviation apparatus." The second operation, which consists in sorting or separating ores of different density, will be productive of greater results. In fact, smelting, almost always resorted to for the treatment of metallic ores, so blends and identifies the metals with extraneous substances, as to render the elimination of the latter a matter of great difficulty; whilst the separation or sorting being once thoroughly effected, there remains to deal with unitarian compounds, and thereby reduction, refining, soldering, melting, and volatilisation are greatly simplified. Separation and sorting are here the more important, as they are to answer a double purpose, by eliminating all extraneous matters; the caloric power will thereby be increased, and all sulphurets, phosphurets, arseniures, &c., shall be almost entirely cleared off. First, "sorting by successive deviations." Suppose three bodies of the same volume, but of different densities; let the first body drop by its own gravity, it will follow a vertical line, unless some action cause it to deviate; but if the same meets with any current of any fluid (even magnetic fluid), and if the said current is sufficiently intense, it will deviate from the vertical line, and drop into the case; the body which is heavier will be deviated little by each body falling at distances proportioned to their weight. Thus it may be said that the sorting or separation of various bodies will take place by successive deviations from the course that each of these would have otherwise run, impelled by a primary projecting force. The bodies to be classed or sorted will then run the resultant, or line resulting from the inert force, imparted by a primary impulse, and from the successive deviations from the same, whatever may be the direction in which these actions are produced. The bodies of the same volume and different density will be deviated with an intensity inverse to their density, and the bodies of same density and different volume will be deviated with an intensity inversely proportionate to their volumes. We will now explain what is termed "electro-sorting," or separating bodies from each other by electric attraction or repulsion, or by electric attraction and propulsion, whatever be the mode of application. Supposing an attractor—a pendulum, for instance, which is electrified by any suitable means; supposing, again, that it having touched a given point has acquired the same sort of electricity, it will be repelled. (The oscillating motion may—nay, must be—effected by any suitable means.) On travelling over a table which is powdered over with substances to be sorted will attract part of the said substances, but on touching the opposite pole of the battery the attracted substances will drop; the same effect will be produced on its return. The table may be an endless band, also electrified, and in certain cases it may retain on its surface certain bodies, whilst the pendulum shall only attract such as the table has not power enough to secure. If, for instance, magnetic substances, iron, or its magnetic oxides, nickel, &c., are to be separated from other substances, the table or band may be electro-magnetised, so that any magnetic body of the same electricity, as iron, will keep on the table, whilst the pendulum will only attract the others, and *vice versa*. Finally, from what has been said, it appears that all combinations tending to produce an alternate or continuous sorting of any substances whatever are applicable, and do not depart from the principle herein specified. The sorting machines may be divided into two principal series, according to the agent that is to work them. Firstly, the machines worked by permanent magnets, either natural or artificial; secondly, the machines worked by electro-magnets. Considering them with respect to the motion of the magnets, we shall describe three principal sorts:—Firstly, the machine with continuous motion, through a circular or any other line round horizontal or vertical axes; secondly, the machines with alternate motion, either rectilinear or circular; and, thirdly, the machines worked by permanent or electro-magnets. As illustrative of the first sort, the machine consists of a series of magnets, the forms of which may be varied or modified, and placed in a copper or zinc case of endless band or table, by means of which the substances to be sorted, spread on by any suitable means (a sieve, for instance), are brought under the machine of a separating partition, for the materials to be classed; and, lastly, if the machine be worked by electro-magnets, a commuter is made to establish the current through the electro-magnets, the nearest to the endless band. If the machine be worked by permanent magnets, either natural or artificial, a brush, or even one or more permanent magnets, placed so as to have their poles corresponding with such as are of the same electricity as those of the machine, will detach from the disc the matters still adherent there. In the machines with alternate motion, the same elements are found as in those described distributor, endless band, commuter for electro-machines, brushers, permanent magnets for machines worked by permanent magnets. The machines worked by permanent magnets consist of a certain number of electro-magnets or permanent magnets, under the poles of which a disc or a zinc or copper plate passes, which is animated with a circular or rectilinear continuous or alternate motion. As in all machines of such description, the disc is intended to carry away the materials by friction, and projections should be contrived on its surface to facilitate this operation. Another description of electro-sorting machines is a horizontal cylinder, slightly inclined, provided with a certain number of metallic rings, inserted so as to turn in bearings. The cylinder is provided with a spiral wire, which surrounds it entirely, passing under the rings; along these wires there circulates a current, which imparts electricity to the metallic rings. By such an arrangement of the electro-magnets, assimilable to a series of electro-magnets placed end to end, in the form of a horse-shoe, one ring will constantly be positive, the next negative, and so forth, with alternation of poles concentrating their action. An endless band, upon which the ores to be sorted are laid, is placed beneath a cylinder, turning round the two drums. Supposing, now, the endless band brought round by a continuous rotary motion, with a quantity of pounded ores, the most magnetic ore will be attracted, and will rush on the first right-hand ring, which is the furthest; whilst the least magnetic will be attracted, and will rush on the left-hand ring, which is the nearest, and such as are magnetic at a less degree will stick to the intermediate rings. The idio-electric substances shall not stir. The magnetic substances collected on the cylinder shall be carried away in its rotary motion, and meet the plane that will detach them, and along which the said substances will glide, thence to be directed to the different partitions. The claim is—firstly, for sorting ores, or separating metals from each other, and from other substances, by electric or other processes; and, secondly, for the means used in order to obtain this result.

RAILWAY CONSTRUCTION—PERMANENT WAY.

At the Institution of Civil Engineers, there was a very interesting discussion upon Mr. W Bridges Adams' paper "On Varieties of Permanent Way," and upon Mr. P. M. Parsons' paper "On some Recent Improvements in Permanent Way."

A description was given of the rolls employed for producing the tapered wrought-iron wedges, used with the joint chairs on Mr. Parsons' system. It was remarked that the paper omitted all notice of the class of fastenings employed previous to the introduction of the wooden key. This class consisted either of iron pins, small iron wedges, or screw bolts, all embodying the same principle of small metal surfaces, bearing upon small points of contact. The fit was generally very imperfect, and the fastenings rapidly deteriorated. When, from any irregularity of fit, an undue strain came upon the bolt, the thread of the screw was stripped, or the nut took a particular set, to which it always returned when screwed up. These fastenings were abandoned simultaneously by all engineers in favour of the wooden keys, which presented an elastic medium to compensate for inaccuracies, and brought comparatively large surfaces into contact.

A recent examination of some brackets and fish plates which had been laid down about twelve months, and were secured by bolts and nuts, showed that in 125 pair of joints, each pair having 8 bolts, 261 bolts were loose, and 6 were out altogether, though they had been tightened up within 48 hours. The number of bolts at each loose joint varied from 1 to 8. It was contended, therefore, that bolts and nuts, such as were ordinarily used, were unsafe, inefficient and expensive fastenings, for connecting together the parts of a permanent way, and that they were not to be relied on.

It was argued that a simpler system, for binding the different parts together was to employ wedges, which were always capable of performing their office, and were tightened up by a blow of a hammer.

With regard to the girder rail, it was contended, that experience had proved its rigidity and want of elasticity to be so great, that the heavy weights now carried on railways would soon destroy its upper surface, and cause it to laminate. The effect, too, of reducing the thickness of the middle web, would be to increase the cost of the rails per ton—and though credit had been taken for a saving in the item of ballast on this system, it was thought that engineers generally would not like to diminish the amount of ballast on a railway.

It was observed, that an essential principle in a permanent way was to form the various lengths of rails into continuous bars, by fixing them firmly at their ends, either by chairs or brackets, or fishes (keyed or bolted), or by break-joint angle plates. With a view to prevent the bolts from getting loose, a system has been devised for locking both heads and nuts, so as to prevent them turning round. This was proposed to be accomplished by bevelling the edges of the bolts and nuts where in contact with the fishes, so as to form grooves in which to drive plate wedges between contiguous bolts, and then to fix them by turning up the corners. It was mentioned that the original "fish" was keyed into the chairs and not bolted; and it was believed that this was firmer than the subsequent modification of the "fish-joint" with bolts, suspended between chairs. To compress the ends of the rails, and at the same time to form square channels for the fishes to lie at rest without strain on the bolts, it was proposed to squeeze the ends of the rails whilst hot, between a pair of dies.

With reference to the comparative weights of the cast-iron sleepers used on the Londonderry and Enniskillen and the South-Eastern lines, it was stated that the lightest portion of the latter was 5 per cent. heavier than the heaviest portion of the Enniskillen permanent way, while the general average was 18 per cent. heavier. Altogether about 225 miles of these cast-iron sleepers had been laid on different railways in England and Ireland during the last five years, and only about 1 per cent. per annum had required to be replaced from all causes. Experiments had recently been made to test the strength of different forms of cast-iron sleepers, for which purpose a falling ram, weighing 12 cwt. was employed. Twenty-three forms were experimented upon, and the result was that an ordinary 80 lb. rail, with 3 ft. bearings, was destroyed by bending, with a fall of 2 ft., while the South-Eastern sleeper bore a fall of 4 ft. 6 in., being 1 ft. more than any other which was tried.

A trial of a short length of De Bergue's cast-iron sleeper way on the Great Northern Railway was stated to have shown that the plate sleepers require a less amount of attention as to packing and lifting, than the ordinary transverse wooden sleepers. The chief defect of this system was asserted to be the method of fixing the rail to the sleeper. It might possess some advantage of cost in some situations, and with modifications would probably be made to answer well for light traffic. Adams's suspended girder rail had also been subjected to a similar trial, and the result was, in some respects very satisfactory. It was nearly equally rigid in all its parts, possessed a certain amount of elasticity, derived from the wings, and but little vertical deflection. It presented great facilities for packing, and could be lifted in less than half the time required by the wood sleeper system. It might be advantageous for the future to increase the width of the tread of the rail.

It was stated, that there were now about 800 miles of single line laid with the Barlow rail, and that though in the first instance transverse wooden sleepers had been used, yet this method had now been abandoned, the rail being laid down without sleepers. The difficulties were the manufacture of a sound rail, and the rigidity of the way when made. The wrought-iron way was more rigid than that of cast-iron. The rigidity of the latter might be overcome, it was believed, by the adoption of Samuel's trough sleeper with wooden fastenings. It was remarked that there were now more than 1000 miles of single line of iron permanent way laid and in operation. The practicability of the use of that material, had, therefore, been proved, though, probably, the best form might not yet have been devised. It was considered singular, that a country abounding in iron should annually expend hundreds of thousands of pounds in bringing timber from foreign countries, to lay and rot on the railways of the Kingdom.

[*To be continued in next week's Mining Journal.*]

CALIFORNIAN LIFE DURING THE GOLD MANIA.

Soon after the discovery of the auriferous deposits in California, accounts reached Europe, not only of the progress of the country, but likewise the lawlessness of the denizens of the newly-settled state; these for a considerable period were regarded as mere exaggerated statements, and it was not until they were absolutely confirmed by many trustworthy persons who had resided there that they were believed. Among those who were excited by the gold fever was Mr. J. D. Borthwick, who has given us the results of his experience in a clever and instructive volume entitled *Three Years in California*. This gentleman started from New York in May, 1851, on board a small barque of little more than 200 tons, bound to Chagres with emigrants, and arrived at that place after 20 days' passage, and here the passengers began arming themselves with bowie knives and revolvers as a note of preparation against the perils they were about to encounter. After the usual delays and difficulties they arrived at Panama; many of the voyagers here had the Isthmus fever, and dosed themselves by alternately swallowing quack recipes and a vile compound vended under the denomination of brandy; it is needless to add that several died. The prevalent amusements of the city for those who had any leisure or money was gambling. Several of the vessels despatched from this port to San Francisco were short of provisions and possessed but inadequate accommodation for the passengers; and the ship in which Mr. Borthwick took his passage was no exception to the rule.

A graphic description is given of San Francisco and its inhabitants, who at that period composed a heterogenous mass of all nations; they were building in all directions, and houses of canvas, wood, and stone appeared to rise almost simultaneously; auction-rooms and gambling houses appeared, to a stranger, to be the two greatest features of the city: the games principally played being the Spanish one of *monte*, and *faro*, at the same time there were *roulette* and *rouge-et-noir* tables, and an infinite variety of small games played with dice, and classed under the general appelation of "Chuck-a-luck." Hand-work was generally better paid than head-work. Men employed themselves in any way, quite regardless of any former pursuits; it was one intense scramble for dollars, and the man who got the most was the best man—how he got them had nothing to do with it. As the majority of the immigrants, as soon as they arrived at the city, started off for the mines, labourers' and mechanics' wages were extravagantly high. Drinking was carried to a high pitch, but the number of drunken men one saw was small, considering the enormous consumption of liquor. Some went at it gradually, and by degrees sunk into stages of misery and incapacity, whilst others drank themselves into *delirium tremens* before they knew where they were. The custom of bar drinking is common in all the States, but in San Francisco the bar keepers excercised their ingenuity in inventing new stimulants for their customers. There were several good American theatres, an Italian opera, Chinese and French theatres, besides concerts, masquerades, a circus, and other public amusements. At the masquerades no weapons were admitted, these having to be left with the check-taker at the door.

The steamers which ply between San Francisco and Sacramento are built in the usual style of the New York river boat, and at this period many were plying on the Californian rivers. At the mines, the clothing trade was all in the hands of the Jews; and during the whole of Mr. Borthwick's sojourn, he never saw any of that tribe lift a pick or shovel, or, in fact, occupy himself in any other way than selling slops. In the case of a row, it was not necessary to wait until a pistol was actually levelled at one's head: if a man made even a motion towards drawing a weapon, it was considered perfectly justifiable to shoot him first, if possible. Arms were never drawn out of bravado; and if a man shot another, without sufficient provocation, he was pretty sure of being accommodated with a hempen cravat by Judge Lynch. In the course of three years, it is stated, 1200 murders have been committed. The staple provisions at the mines were flour, pork, and beans, with occasionally a little fresh beef. Their great recreations are gambling and drinking; while the accommodation comprised every degree of discomfort, rats being predominant; so much so, that on retiring to bed, watches were kept to shoot them, it being regarded as good sport.

The Cornish miners who had come from the mines of Mexico and South America, as well as the lead miners from Wisconsin, generally devoted themselves to the deep diggings. The laws made at the Creek are all framed by the miners themselves, and in cases of disputes, a jury is empanelled, and their verdict is binding on both plaintiff and defendant. The diggings at the Yuba River, with several others, were visited, as well as the cities of Nevada and Downieville, which place possessed all the characteristics of San Francisco, though in a minor degree. The diggings round Downieville are very numerous; and in the neighbourhood are several canals and flumes, the water being of great assistance to the miners; several of the companies formed for supplying them with this necessary ingredient returning large dividends to their shareholders. The want of a circulating medium was greatly felt in the state, and coins of all countries passed current, in order to make up the deficiency. The Government assay-office issued a large octagonal gold piece of the value of $ 50, about twice the size of a crown-piece; but the greater part of the five, ten, and twenty dollar pieces, were coined by private firms in San Francisco. Silver was much more scarce, and many pieces were generally current at much above their value.

The climate of San Francisco is generally healthy, and favourable for the cure of gun-shot wounds; which, considering the constant use of pistols in that city, is thought highly providential. The Mexican, Chilian, and other Spanish-American miners, all adhered to their old-fashioned, primitive style of washing, though they had the example of all others before them making improvements, whereby time was saved, and labour rendered tenfold more effective. Among the miners, the fashionable dances were waltzes and polkas; but the favourite was the quadrille of the "Lancers," now the rage in Paris. The absence of ladies was a difficulty easily overcome by a simple arrangement, whereby it was understood that every gentleman who had a patch on a certain part of his inexpressibles should be a lady for the time being. These were in general of canvas, on a dark ground; and the ladies were equally as conspicuous as if they had been surrounded by the usual quantity of white muslin. Mr. Borthwick gives a detailed account of the various mining locations, as well as the habits of the different people settled among them. In his opinion, the French are excelled by the English and American as miners—they are not so daring and energetic; but with regard to the creature comforts of life, they in general fare much better.

We have exceeded the limits of our space in noticing this interesting and amusing work, and we would recommend all who are interested in new settlements, to peruse *Three Years in California*, as it will not only wile away the tedium of a dull hour, but at the same time afford sterling information to the reader.

IMPROVEMENTS IN STEAM-BOILERS.—Mr. B. Goodfellow, of Hyde, near Manchester, proposes a method of preventing, at least to a very great extent, the rupture in the bottom of boilers, especially Cornish and two flued. He considers that the ruptures arise more immediately from the uneven changes in the form and size of the different parts of the boiler, consequent upon the changes of heat and cold which take place every time the boiler is stopped or started, especially for cleaning. A boiler of 30 ft. long will be at least three quarters of an inch greater in length when at work, and consequently heated to a higher temperature than when cold; and it is almost impossible that the exterior shell of the boiler and the interior flues should lengthen and shorten uniformly at the same time. The shell and flues of the boiler must therefore be subjected to very great and undue strains alternately, the one of compression and the other of tension, which gradually work the plate asunder in its weakest part, which is the seam across the rivet holes, making it have the appearance of bad iron, owing to its being gradually worked in two, and the water getting into it. This effect is greatly promoted by the flues being placed nearer the bottom than the top of the boiler, and consequently offering a greater resistance to the bottom of the boiler when it seeks to contract, which it must do, and very rapidly, when a boiler is let off for cleaning and immediately filled with cold water to prepare it for the workman entering it, as is often the case where time is not allowed for the gradual and natural cooling of the boiler, and *vice versa*, when the fire is first put into the flue, it will seek to expand somewhat sooner than the shell of the boiler, a tendency which is opposed by its being so firmly fixed to the casing by the gusset stays now so commonly used. He considers that such ruptures most frequently occur in the bottom and middle of the boiler, because the wall or bed upon which the middle part of the boiler bottom rests does not expand or contract uniformly with the boiler itself. The part next the centre having to overcome not only its own friction against the bed, but that of all other parts between it and the end, and consequently the greatest strain is thrown on the centre and induces a fracture at that part. He recommends a cylindrical shell and a simple cylindrical flue, fixed along and in the centre, leaving a space betwixt the flue and the shell sufficient for a man to get round to clean the boiler, &c., and let the boiler be entirely without stays except that formed by the flue itself. In a boiler thus constructed, the ends could move inward and outward in adaptation to every change in the lengths of the shell and the flue, without injury to either or to the ends themselves. Along the bottom, inside, from end to end, let T or angle iron stays be fixed lengthwise, to assist in strengthening it, and enable it to undergo with less injury the strain resulting from its friction upon the brickwork. A boiler thus constructed would, with reasonable care, be quite safe; at the same time it would be as economical a working boiler for stationary purposes as any known, and would be found to work twice the length of time (if not considerably more) than boilers of the ordinary construction. Two, three, or more T or angle iron rings (according to the length of the boiler) might be placed round the flues at equal distances to diminish the danger of their collapsing, except an extra one round the fire-place, where the plates are most liable to be injured when the boiler is short of water. He is quite willing to have his boiler tested against those upon other principles, and feels confident of success, and contends, as regards the many two-flued boilers now at work, the best means to keep them in good order is to have them strengthened by T or angle-iron stays in the bottom, as described, and to have them cooled as gradually as possible whenever emptied for cleaning or other purposes.

GOLD QUARTZ LIQUEFACTION—EXTRAORDINARY INVENTION.—The *New York Tribune* notices an alleged discovery by a Dr. Benjamin Hardinge for the liquefication of quartz rock, for the extraction of the last particles of gold or other precious metal which that rock may contain; and for the holding of that hitherto solid rock in the form of a liquid in casks and hogsheads ready to be turned again into rock when it is needed, thus affording a new material for building cheaper than brick and beautiful as precious stones. Such are some of the features of this surprising announcement, which is fortified by the certificates of respectable chemists and metallurgists. The Doctor advertises his discovery in three long columns of our contemporary, which, while viewing his statements with emotions of wonder, desires that he, not it, should be held responsible for them.

ALBION PORCELAIN AND BLEACHING CLAY COMPANY, ST. ENODER, CORNWALL.

Capital, £8000, in 8000 shares of £1 each; payable, 10s. on allotment, and 10s. within three months.

To be registered with Limited Liability.

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Mr. ROWLAND HILL, Birchyfield Colliery, near Oldbury, Staffordshire.
Mr. J. G. PARKER, Tulse-hill, Norwood, Surrey.
Mr. T. M'LEOD, Folkstone.

MANAGING AGENT—Capt. J. Webb, St. Austell, Cornwall.

PURSER—Mr. Thos. Lewis, Corn Exchange-buildings, Carr's-lane, Birmingham.

The sett this company is formed to work is universally admitted to be equal to any in Cornwall, both as regards the quality and quantity of the clay produced. The machinery, &c., are of first-rate description, and capable of making a much greater quantity than is at present being made. The clay is well known, both in England and the Continent, to be of very superior kind, it having been used by the trade for the last four years. In addition to this sett, the directors have taken, at a very low royalty, a very superior mine of bleaching clay, which adjoins the above sett, and which can be opened at a very small outlay, and will, combined with the porcelain works, realise at least a profit of 20 per cent. Unlike mining adventures, this undertaking is devoid of speculation; in fact, it is a *bona fide* investment, and as such the directors unhesitatingly recommend it to the public as worthy of their consideration. There are already upwards of 3000 shares taken; it is, therefore, desirable that those who wish for shares should make application forthwith to the purser, Mr. T. LEWIS, Corn Exchange-buildings, Carr's-lane, Birmingham, from whom prospectuses, and all other requisite information, may be obtained.

Application for shares to be accompanied with a deposit of 10s. per share.

SLATE.—The BANGOR ROYAL SLATE COMPANY have now ON HAND a large assortment of ROOFING SLATES, BLUE and GREEN, to the usual sizes, which they are prepared to SUPPLY on the usual terms, for shipment from their depôt at Bangor, or to transmit by railway; also, SLABS of all sizes.

Orders to be addressed to Mr. EDWARDS, manager, Royal Slate Quarries, Bangor.

SLATE SLABS AND ROOFING SLATES.—The PROPRIETORS of the NEW MACHNO SLATE and SLAB COMPANY (LIMITED) have, at great cost, made arrangements to convey their produce from their quarries near Ffestiniog to Conway, to obtain the great advantage of access to the railway, giving them the facility of executing orders without the slightest delay. They trust that making Conway their shipping port will not cause them to be confounded with those hitherto known as the CONWAY SLATES, as the MACHNO SLATES are ENTIRELY FREE from PYRITES, or any metallic substance liable to OXIDATION; and, from having been tested in Wales for at least half-a-century, are found to attain a degree of hardness, by exposure to the atmosphere, unknown in any other vein. The MACHNO SLABS are too well known to need commert, but the annexed valuable testimonial from Mr. Magnus, and also a strong chemical test to which they have been subjected, will better explain their quality:—

Pimlico Slate Works, Upper Belgrave-place, London, April 7, 1855.—GENTLEMEN: I very readily offer my testimony to the excellence of your slabs raised at the Machno Quarries. I prefer them to all others obtained in North Wales, with one exception, and that is much of the same quality as the Machno. The slabs can be obtained of large sizes, and of every requisite thickness. They are homogeneous in texture, strong, of good colour, free from spots and other impurities, pleasant to the tool of the mason, easily planed and moulded, and will bear exposure to a much higher degree of heat than slabs from any of the Carnarvonshire quarries.

Signed, G. E. MAGNUS.

To the Proprietors of the Machno Slate and Slab Quarries.

Liverpool, Oct. 18, 1855.—DEAR SIR: The experiments which I have tried on the specimen of slate, in reference to its capability of resistance to acids, enable me to pronounce it in every way capable of retaining boiling vinegar, without injury either to its own substance, or to the contained vinegar. A piece of the slate, weighing 95 grs., was exposed for 26 hours to the action of cold strong nitric acid; it was then boiled in the same acid for 20 minutes, and when washed, dried, and weighed, was found not to have lost perceptibly in weight. This I consider the most conclusive experiment.

Signed, GEO. C. HUSON.

Wm. Orme Carter, Esq., Machno Slate and Slab Company.

All communications must be addressed to the resident director, Mr. T. H. WHEELER, Conway, North Wales.

IRON HOUSE AND SELF-SUPPORTING ROOF MANUFACTORY, WOODSIDE, BIRKENHEAD.—Messrs. WILSON and CO. beg to call the attention of Engineers, Shippers, Farmers, and others, to their PATENT PORTABLE FIREPROOF HOUSES, STORES, SHOPS, COTTAGES, VILLA RESIDENCES, CHURCHES, SCHOOLS, FARM BUILDINGS, SHOOTING BOXES, &c., either with or without self-supporting roofs; also, CONSERVATORIES, GREEN and HOT-HOUSES.—Manufactory, Woodside, Birkenhead.

N.B. These houses are so constructed that they do not require the aid of an artisan to re-erect them. Detailed plans and drawings furnished free of charge.

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London: Longman, Brown, Green, Longmans, and Roberts, Paternoster-row; Editor's Offices (Offices for Patents), 47, Lincoln's Inn-fields, and 166, Buchanan-street, Glasgow.

DEVON IRON MINING COMPANY (LIMITED).

In 500 shares of £5 each.—£2 10s. per share to be paid on allotment.

N.B. Of this payment, £1 per share to be working capital, and £1 10s. per share to be paid to the former proprietors. The remaining £3 10s. per share is not expected to be required, and is not to be called up without the sanction of a special general meeting of the company, called for that purpose.

Committee of management and agents to be appointed at the first general meeting of the company.

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Applications for shares to be made in the form annexed, and to be sent to Mr. W. P. PAULL, solicitor, 7, Park-street, Plymouth, treasurer *pro tem.*; or to Mr. ALBERT MILETED, 3, Devonshire-cottages, Union-street, Plymouth, secretary *pro tem.*

This company is formed for working an iron mine, or rather ironstone quarry, to be called the Devon Iron Mine, situate in White Cleave estate, Buckfastleigh, Devon. The Buckfastleigh district has recently proved to be very rich in minerals, and the more it is developed by mining operations the more does it open a field for successful mining enterprise. Amongst the mines of this district, the Devon Iron Mine is certainly one of the most extraordinary, the lode, or rather fissure, being literally an immense mass of very rich iron ore, of a rare and most desirable nature, producing metal so hard as to be near akin to steel, and admirably adapted for the manufacture of steel direct, as has been already proved.

Mr. J. Mitchell, of Westbury, near Bristol, reports on a sample of the ore which he assayed as follows:—"Iron glance from Buckfastleigh contains carbonate of iron of very superior quality—68 per cent. of very good iron. If you can find a large quantity, it would make a good price as an iron ore called iron glance, which is a very valuable ore."

From the above assay, and trials which have been made by ironfounders and others, it is ascertained that the produce of the ore averages 60 per cent.; and as everything preliminary to the raising of unlimited quantities of it has been already done, and the mine can be set at work and carried on with a small outlay, and very large returns can be made immediately, it may be looked upon more as a commercial investment than a speculation. As some evidence of the favourable character and prospects of the undertaking, it may be observed that offers have been made to break the ore at the exceedingly low rate of 1s. per ton. Samples have been submitted to some of the principal ironmasters, who are ready to buy large quantities at a price which will leave a good profit; and it is estimated that, as soon as the company are in a position to effectually avail themselves of the vast resources of the mine, it will become a highly remunerative and valuable property.

The mine is held under a recently granted 21 years' mining lease of White Cleave estate, embracing all kinds of ores, metals, and metallic minerals, at a rent of 70*l.* per annum, in lieu of royalty or dues in respect of iron and iron ore, and at a royalty or dues in respect of all other ores, metals, and metallic minerals.

It may be added that the sett contains abundance of limestone, and arrangements can easily be made for establishing lime kilns, which would doubtless be found profitable and very advantageous.

FORM OF APPLICATION FOR SHARES.

To the Promoters of the Devon Iron Mining Company.

I hereby request you to allot me shares in the above company, and agree to accept that or any less number, and to pay £2 10s. per share on allotment to the treasurer or bankers of the company. Name in full.....
Dated the day of 1857. Address .....
Profession or occupation .....

ORIENTAL INLAND STEAM COMPANY (LIMITED).

FOR ESTABLISHING
STEAM NAVIGATION ON THE RIVERS OF INDIA.

Capital £250,000, in 25,000 shares of £10 each.—Deposit 10s. per share.

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This company rests its claims to public support on two plain considerations—1st. That the steam companies already navigating the rivers of India are realising large profits; and 2d. That the vessels of this company will, by the aid of improvements to which it has the exclusive right, be able to carry three or four times the quantity of cargo that can be carried by the vessels at present employed. Cheap conveyance is necessary to India to enable the produce of the interior to reach the coast. Of all known means of conveyance, the cheapest is conveyance by water; and railways, even when made, cannot supersede the necessity of navigating the great rivers, which will still remain the great arteries of commerce, as has been found to be the case in America, and where experience has shown that railways and river conveyance assist instead of opposing one another. The rivers of India are of vast extent—they flow through the richest parts of the country—and they only require that vessels should be established upon them which shall be capable of carrying a large cargo on a light draught of water, to ensure results more remunerative than is usual in commercial undertakings.

The calls will not exceed £2 per share every three months; and interest at the rate of 5 per cent. per annum will be allowed on all calls during construction, and also on shares paid in advance.

Prospectuses and forms of application for shares may be obtained from J. S. WALKER, Esq., 25, Austinfriars; or from the secretary, at the offices of the company, 9, Billiter-street, London; but no application will be considered unless accompanied by the receipt of Messrs. Williams, Deacon, and Co., for 10s. per share on the number of shares applied for. This deposit will be returned in the event of the application not being acceded to. By order of the Board, JOHN MATHEWSON, Sec.

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JOHN BOURNE, Managing Director.

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